電子顕微鏡による染色材の観察

AUTHOR(S):

林, 昭三

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Electron Microscopic Observation of Wood Stained with Dyestuffs

Shōzō HAYASHI*

林　昭三*：電子顕微鏡による染色材の観察

For observing water penetration into wood, some sorts of dyestuffs are usually used instead of water itself, for visualizing it also under the microscope. It has been reported in our previous paper[1] that the aqueous solution of acid fuchsin acts nearly as water alone at the time of penetration. In the case of malachite green or safranin solution, water goes always ahead of dye at the head of penetration by separating one another and the pigment is apt to retard in wood structure. Thus some wood specimens stained with dyestuffs were preliminarily observed under the electron microscope with the aid of replica.

The replica method is as follows:

1. The dyestuff was penetrated into a block of AKAMATSU (*Pinus densiflora* SIEB. et ZUCC.) wood, and after drying, the block was splitted parallel to the grain to obtain its surface splitted radially.

2. Acetyl cellulose film (Bioden R. F. A., 0.034 mm thick) was dipped in methyl acetate for about 2 seconds and sticked on the radial surface of block.

3. After evapolating methyl acetate in a few minutes, the film was stripped from the surface. This is a negative replica of the first stage.

4. This replicated film was sticked on a slide glass with adhesive tape, and put in a vacuum evaporator.

5. Chromium shadowcasting was carried out at 45°, then carbon was evaporated on the top of chromium sheat perpendicular to the horizon. The distance from specimen to source was kept at interval of about 8 cm, and the amount of evaporated chromium was about 20 mg.

6. The chromium-carbon deposit surface was scratched for graduating into 1～2 mm square by a needle, and sticked it in pieces on a sheat of glass, about 10 mm square, which was covered with paraffin, m. p. 45°C.

7. The glass piece was dipped in methyl acetate after cooling of paraffin.

* Division of Wood Biology, 木材生物研究部門

8. When the acetyl cellulose film on the glass swelled, it was put in an incubator at 50°C.

9. After removal of acetyl cellulose and paraffin, the positive replica of chromium-carbon film appears in the methyl acetate.

10. This positive replica, thin and fragile film, was washed with fresh methyl acetate of the same temperature and dipped up on a sheet mesh. This is the sample under the electron microscope of the subject.

Thus the following electron micrographs shown in Photos 1~9 were obtained as the result of this observation.

Consequently, recrystallized particles of acid fuchsin were observed on the bordered pits and the secondary wall of tracheids but particles of marachite green and safranin only on the pits in thecase of this study, and the recrystallized particles of marachite green and safranin in wood were obviously larger than of acid fuchsin. The particles of acid fuchsin dried on a sheet mesh were similer to the particles dried in wood, but the particles of marachite green and safranin were different in shape. The particles of marachite green dried on a sheet mesh showed needle crystals, but in wood they showed plate crystals. The plate crystals of safranin dried on a slide glass were much larger than in wood.

It would seem that these facts are one of the reason causing the difference of penetrability.

Literature

1) KISHIMA, T. and S. HAYASHI, Wood Research, No. 24, 33~45 (1960).

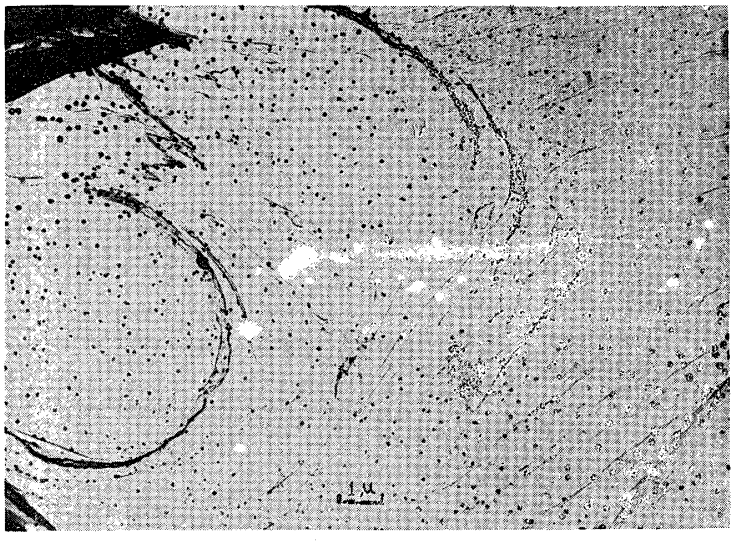

Photo 1. Scattered particles of acid fuchsin on and around a bordered pit.

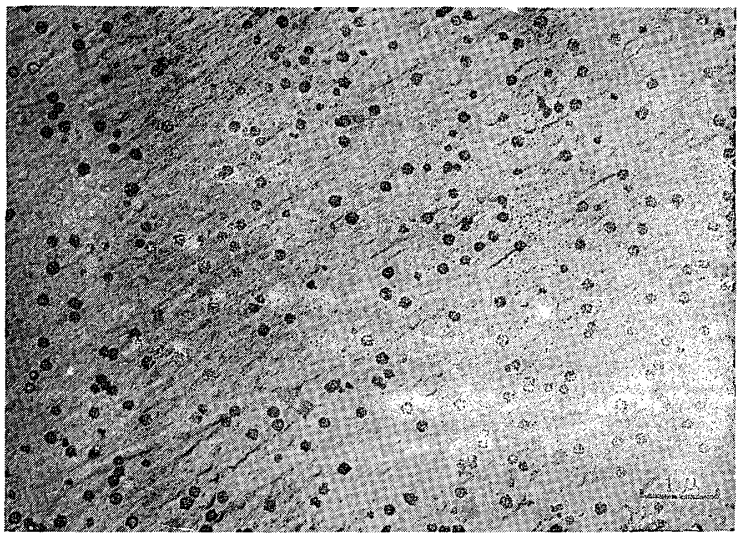

Photo 2. Scattered particles of acid fuchsin on the secondary wall of tracheid.

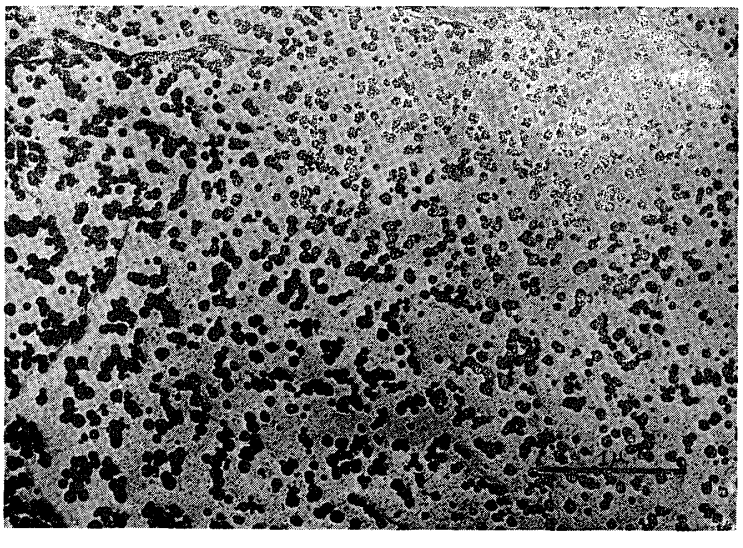

Photo 3. Acid fuchsin solution dried on a sheet mesh coverd with collodion film.

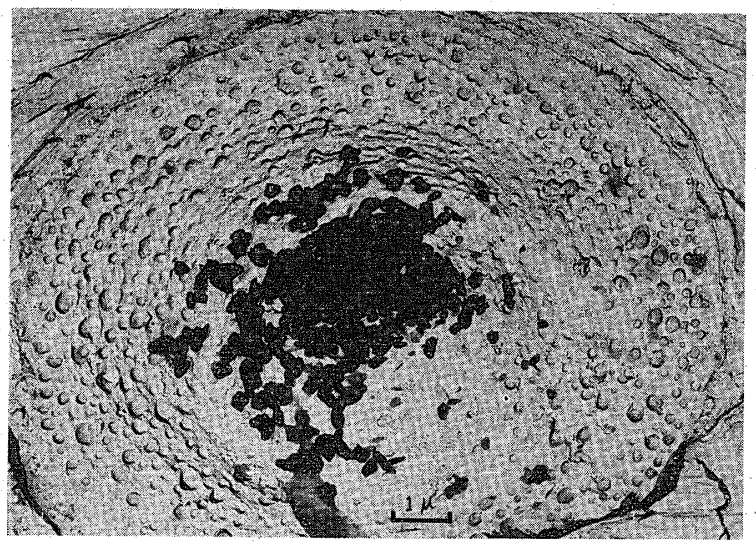

Photo 4. Grouped particles of marachite green at and around a pit aperture.

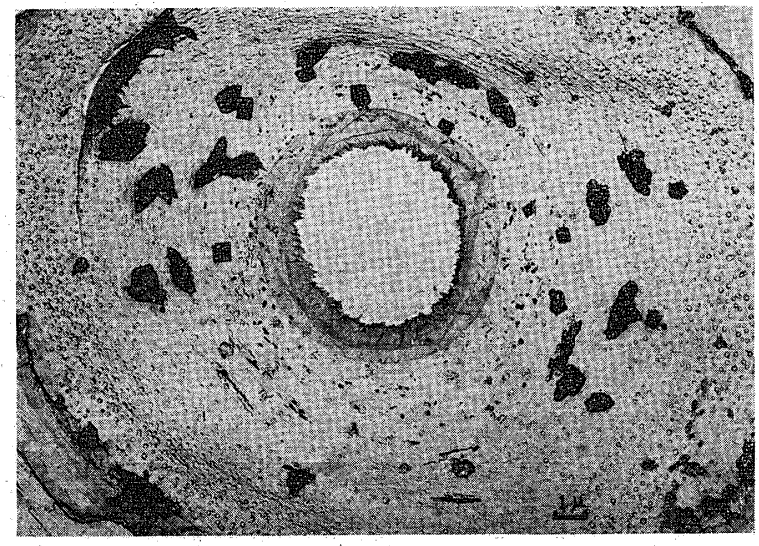

Photo 5. Scattered particles of marachite green on a pit border.

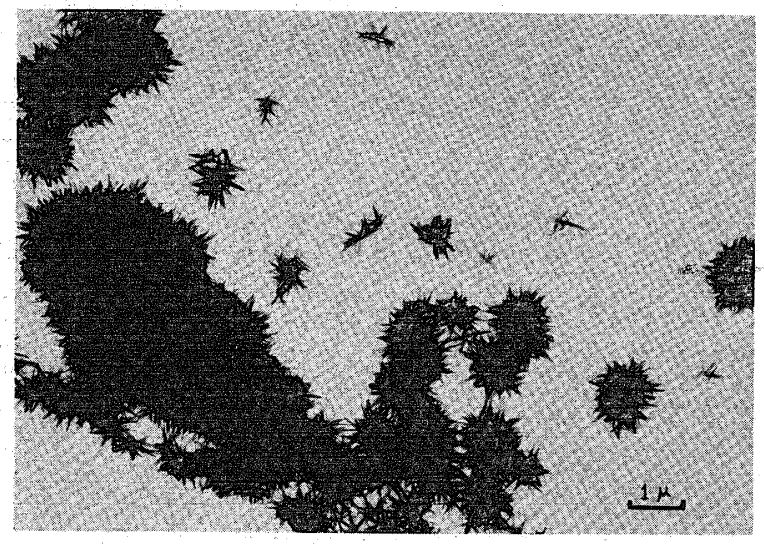

Photo 6. Marachite green solution dried on a sheet mesh coverd with collodion film.

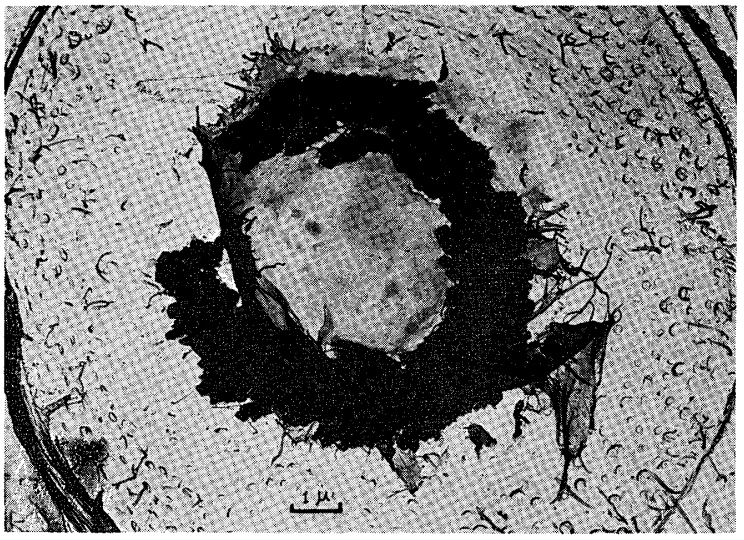

Photo 7. Accumulation of safranin particles around a torus. Showing movement of the solution through this portion of pit.

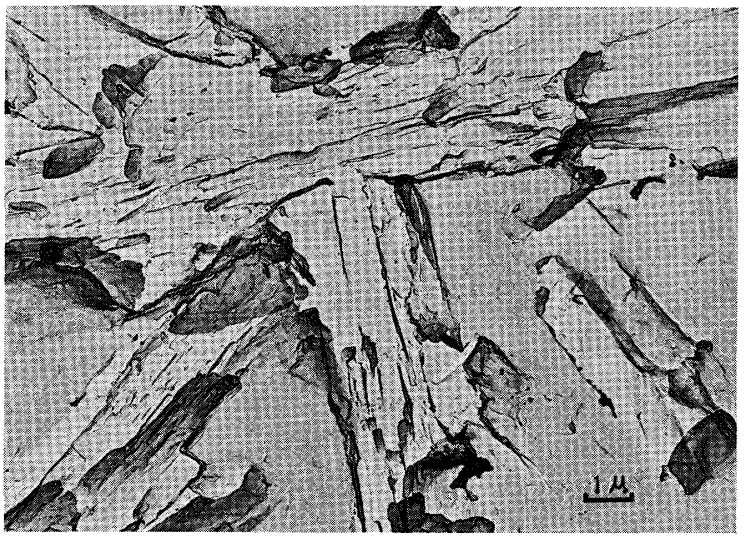

Photo 8. Safranin solution dried on a slide glass.

Photo 9. Safranin solution dried on a slide grass.